SNS Linac Technical Memo

Segmented Halo Scraper Outgassing Rate

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WBS 14.5.2.? (Diagnostics – Segmented Halo Scraper)

Vacuum Loads for SNS Segmented Halo Scraper

Summary : In order to do the initial design of the D-plate vaccuum system a calculation was done to estimate the out-gassing load from the Segmented Halo Scraper. Note that as the designs of these devices become more mature, the responsible person should update these values and pass the information on to the vacuum system designers, especially if the new values exceed these presented here.

The assumptions made were:

Device will consist of 8 carbon/graphite plates mounted to a copper backing.

Kapton signal lines will be used.

Conclusion

The estimated out-gassing rate for the Energy Degrader is 1.667 x 10^-6 torr*L/s

Inner surfaces exposed to vacuum:

$Seg_C := (3.1\,in \cdot .5\,in + 3.1\,in \cdot .06\,in + 2 \cdot .5\,in \cdot .06\,in) \cdot 8$

$Seg_C = 92.697\ cm^2$

Leak rate carbon

$LR_C := 1.74\,10^{-8} \cdot \frac{torr \cdot L}{s \cdot cm^2}$

Total outgassing due to carbon

$OGR_C := Seg_C \cdot LR_C$

$OGR_C = 1.613 \times 10^{-6}\ \frac{torr \cdot L}{s}$

$Seg_{Cu} := (6.52 \cdot in \cdot 1\,in + 6.52 \cdot in \cdot .25 \cdot in \cdot 2) \cdot 8$

Leak rate of Copper

$$LR_{Cu} := 1 \cdot 10^{-10} \cdot \frac{torr \cdot L}{s \cdot cm^2}$$

Total outgassing due to copper

$$OGR_{Cu} := Seg_{Cu} \cdot LR_{Cu}$$

$$OGR_{Cu} = 5.048 \times 10^{-8} \frac{torr \cdot L}{s}$$

$$bar := 760 \cdot torr$$

$$mbar := .001 \cdot bar$$

Total surface area of kapton wires

$$Wire := 8 \cdot \pi \cdot .024 \cdot in \cdot 12 \cdot in$$

$$Wire = 46.698\ cm^2$$

$$LR_{kapton} := 1.1 \cdot 10^{-10} \cdot \frac{mbar \cdot L}{s \cdot cm^2}$$

$$LR_{kapton} = 8.36 \times 10^{-11} \frac{torr \cdot L}{s \cdot cm^2}$$

$$OGR_{wire} := LR_{kapton} \cdot Wire$$

$$OGR_{wire} = 3.904 \times 10^{-9} \frac{torr \cdot L}{s}$$

Total out-gassing rate of the segmented scraper is:

$$OGR_{scraper} := OGR_{Cu} + OGR_{C} + OGR_{wire}$$

$$OGR_{scraper} = 1.667 \times 10^{-6} \frac{torr \cdot L}{s}$$